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Radionuclide Techniques for Detection of Occult Abscesses

THE DIAGNOSIS of occult abscess is still a clinical enigma. Various isotopic techniques including static imaging and dynamic flow studies have been used with variable results. Combined liver-lung scans are used to detect subphrenic abscesses but are unreliable in the presence of ascites and basilar lung diseases. Blood pool agents may outline larger abscesses as avascular masses. This method, however, lacks sufficient sensitivity.

Recently, leukocytes labeled with chromium 51 (^{51}Cr), technetium Tc 99m sulfur colloid ($^{99\text{m}}\text{Tc-SC}$) and gallium citrate Ga 67 (^{67}Ga) have been used. ^{51}Cr -labeled leukocytes produce images that are less than ideal due to the intense background activity resulting from margination of leukocytes along the vessel walls. ^{51}Cr labeling may also impair leukocyte function. ^{67}Ga -labeled leukocytes will localize in abscesses which are only 3 to 14 days old. Advantages of ^{67}Ga -labeled leukocytes are that incisional abscess can be detected and there is less background activity in the reticuloendothelial system making abdominal lesions more apparent. However, low count rates and nonspecific labeling restrict its clinical usefulness. $^{99\text{m}}\text{Tc-SC}$ -labeled granulocytes offer some promise since they are viable *in vivo* and retain both chemotactic and phagocytic properties. This technique is sensitive but gives false positive results in the presence of thrombi. $^{99\text{m}}\text{Tc-SC}$ -labeling allows early scans to be done, which is a benefit in extremely ill patients.

Gallium citrate Ga 67-scanning is the most common and tried isotope procedure for the detection of inflammatory lesions. Scans done at 24 to 72 hours will show most of the active infections. Unlike the localization of gallium in tumors, concentration in abscesses occurs rapidly allowing scans to be done as early as two to four hours after injection. The early scans have the added advantage of minimal gallium excretion in the colon making it easier to detect abdominal lesions. The uptake of gallium by abscesses is

dependent on the inflammatory activity and number of leukocytes. The concentration diminishes with response to chemotherapy. The state-of-the-art when searching for obscure infections is to do early (about 4 hours) scans followed by delayed images. A positive study, however, is non-specific and abnormalities will be seen in tumors, granulomas and surgical wounds. Clinical correlation is necessary to differentiate among these possibilities.

The gallium citrate Ga 67-scan still remains the most popular technique. Leukocyte labeling is highly technical and still in the experimental stage. It is possible that combined studies using gallium citrate Ga 67 and labeled leukocyte will eventually be the preferred approach in achieving maximum sensitivity and specificity.

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Large-Field versus Conventional Scintillation Cameras

SODIUM IODIDE SCINTILLATION CRYSTALS, the core of detector systems in nuclear medicine, are produced by "growing" them from their center. Their size is restricted by the expense of the manufacturing process and the frequent appearance of defects with increasing size. In the past ten years, scintillation cameras used clinically have been limited to crystals with an effective viewing area of about 10 inches in diameter. Recent advances in crystal technology, however, have enabled manufacturers to make available commercially scintillation cameras with a field of view of up to 15 inches.

In comparison with conventional scintillation cameras, large-field scintillation cameras have substantially increased sensitivity for equivalent amounts of radioactivity, with only a minimal sacrifice of resolution (pictorial detail). Large organ areas, such as both lungs or liver and spleen together, can be visualized on a single image with better sensitivity and resolution than with the older devices. The large-field cameras are particularly suited for ventilation studies with radioactive gas. These have to be done during